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REGISTER

OF

THE LEHIGH UNIVERSITY,

FOR THE YEAR 1877-78.

TUITION FREE.

SOUTH BETHLEHEM, PA.
1878.

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REGISTER

OF THE

TRUSTEES, OFFICERS AND STUDENTS

OF

THE LEHIGH UNIVERSITY,

SOUTH BETHLEHEM, PENNA.,

FOR THE YEAR 1877–78,

WITH THE PLAN OF ORGANIZATION AND COURSE OF INSTRUCTION.

TUITION FREE.

FOUNDED BY ASA PACKER.

BETHLEHEM, PA.:
Henry T. Clauder, Printer.
1878.

CALENDAR.

1877-78.

1877.		
Sept. 5.	First Term begins	Wednesday.
Nov. 29.	Thanksgiving Day	Thursday.
Dec. 22.	First Term ends	Saturday.
1878.		
Jan. 12.	Second Term begins	Saturday.
Feb. 22.	Washington's Birthday	Friday.
March 6.	Ash Wednesday	
April 18.	Easter Holidays begin	Thursday.
April 22.	Easter Holidays end	Monday.
June 7.	Annual Examinations begin	Friday.
June 14-15.	Examinations for Admission	Friday and Saturday.
June 16.	University Sermon	Sunday.
June 19.	Reading of Theses	Wednesday.
June 20.	University Day	Thursday.

1878-79.

1878.		
Sept. 2-3.	Examinations for Admission	Monday and Tuesday.
Sept. 4.	First Term begins	Wednesday.
Nov. 28.	Thanksgiving Day	Thursday.
Dec. 21.	First Term ends	Saturday.
1879.		
Jan. 11.	Second Term begins	Saturday.

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THE LEHIGH UNIVERSITY.

ORIGIN.

The HON. ASA PACKER of Mauch Chunk, during the year 1865, appropriated the sum of Five Hundred Thousand Dollars, to which he has since added one hundred and fifteen acres of land in South Bethlehem, to establish an educational institution in the rich and beautiful Valley of the Lehigh. From this foundation rose THE LEHIGH UNIVERSITY.

DESIGN.

The original object of Judge Packer was to afford the young men of the Valley a complete technical education for those professions which had developed the peculiar resources of the surrounding region. Instruction was to be liberally provided in Civil, Mechanical and Mining Engineering; Chemistry, Metallurgy and Construction, and in all needful collateral studies. French and German were made important elements in the collegiate course. A School of General Literature was a part of the original plan, together with tuition in the ancient Classics, while the Institution was freely opened to pupils from every part of the country and the world.

It is proposed, as soon as practicable, to establish various other technical professorships, and at the same time to develop and enlarge the Classical Department, and to have all the appointments of a complete University.

FREE TUITION.

It will be observed that all these educational facilities are provided without charge. Through the generosity of the Founder, the Trustees were enabled, in 1871, to declare tuition FREE in all branches and classes. The Lehigh University is open to young men of suitable talents and training from every part of our own land and of the world. We especially call to this fact the attention of the pupils of our public schools and of the graduates of classical institutions. Thus is offered, *without charge*, every facility for mastering the professions of the Civil, Mechanical and Mining Engineer, and of the Metallurgist and Analytical Chemist. In the Classical and Scientific departments of the School of General Literature instruction is given to those who wish to become Lawyers, Clergymen, Physicians, Editors, or Merchants.

PUBLIC WORSHIP.

Prayers are attended in the Chapel every morning, and all the students are required to be present.

Divine Service is held on every Sunday morning, according to the forms of the Protestant Episcopal Church, in the Chapel of the University. Attendance at this service is required of every student, except in case of those connected with other religious bodies, to whom the President will grant permission at the beginning of each term (if requested by the parent or guardian, or by the student himself if he be 21 years of age) to attend during that term the place of worship of the body with which he is connected, where attendance on Sunday morning will in such cases be required.

SITE.

Nothing is wanting in the situation of the Institution. The salubrity of the climate and the beauty of the scenery cannot be surpassed. Situated in a region famous for its vast railway and manufacturing enterprises, near some of the richest iron and coal mines in our land, accessible to the great mechanical works of New York and Philadelphia, the students have rare facilities for confirming the teachings of the recitation room by the observation of the eye.

COMMUNICATIONS.

The University Buildings are about a half-mile from the depot, at the junction of the Lehigh Valley and North Pennsylvania Railroads, thus affording communication with all sections of the country. New York is about ninety, and Philadelphia fifty-four miles distant.

BUILDINGS.

Packer Hall, named after the Founder, stands seven hundred feet back of Packer Avenue, at the base of the Lehigh Mountain. Built of handsome stone, it presents to the north a noble and imposing front. At the western extremity is a belfry tower containing the President's Room and the Archive Room. The eastern end is a large advanced wing in which are Lecture and Recitation Rooms, and also a thoroughly equipped chemical Laboratory. The central portion, eighty feet long, contains the Chapel, Drawing Room and Cabinets. To the east of Packer Hall stands the University Library, erected by the Founder in memory of Mrs. Lucy Packer Linderman. To the west, within the grounds, are the houses of the President and Professors, comporting architecturally with the great Hall. Towards the north-eastern extremity stand Christmas Hall and Saucon Hall, commodious brick edifices, containing students' rooms, heated by steam and lighted by gas, and a mess hall. At the south-western extremity stands the Sayre Observatory, the gift of Robert H. Sayre, Esq., of South Bethlehem, containing an Equatorial and Zenith Telescope, Transit Instruments and Astronomical Clock.

EXPENSES.

As before stated, tuition is FREE in all branches and classes. Books, materials, paper, pencils, chemical materials used in the analytical laboratory, and instruments, are furnished by the student.

Rooms and board are provided in the University buildings under the following rules:

1. The amount of room-rent, board, &c., for each term, must be paid in advance to the Treasurer of the Executive Committee, who will furnish the student with board ticket and key of room.

2. The charge for board and room-rent shall be $5 per week. Where two students occupy a room jointly, the charge shall be $4.50 per week for each.

3. The charge for board without room shall be $4 per week. The charge for room-rent without board shall be $2 per week for each room.

4. These prices include gas and heat.

5. Meal tickets will be furnished by the steward to students or friends visiting them, at 50 cents each, payable in advance to the steward.

6. The choice of rooms shall be in the order of the classes; in any class the first applicant to have the first choice.

7. Students may retain their rooms from year to year by giving notice of their intention so to do at the close of the academic year, and by procuring their tickets therefor on or before the first day of the next term.

8. Students are required to keep their rooms in order, or to employ some proper person to do so for them.

9. No furniture for rooms will be provided by the University.

10. The use of kerosene, coal oil or burning fluid, in any of the buildings, is prohibited.

Note.—Where clubs are formed the expenses of the student need not exceed $3.50 per week.

DIPLOMAS AND CERTIFICATES.

The Diploma is given only to those who have passed examinations in a regular course in the classes and in one of the Schools. For all partial courses a certificate is given of what the student has accomplished.

POSTGRADUATE DEGREES.

M. A.

The Faculty will recommend for the Degree of Master of Arts, candidates otherwise properly qualified, who, after taking the Degree of Bachelor of Arts, shall pursue for at least two years, at the University a course of liberal study approved by the Faculty, pass a thorough examination on the same, and present satisfactory theses.

Ph. D.

The Faculty will recommend for the Degree of Doctor of Philosophy candidates, otherwise properly qualified, who, after taking either of the Degrees of Civil, Mechanical or Mining Engineer, or Analytical Chemist, shall pursue, for two years, a course of advanced Scientific study in the line of their profession, pass a thorough examination in the same, and present satisfactory theses.

D. Sc.

The Faculty will recommend for the Degree of Doctor of Science, candidates otherwise properly qualified, who, after taking the Degree of Bachelor of Science, shall pursue for at least two years, at the University, a course of Scientific Study, embracing two subjects approved by the Faculty, pass a thorough examination, showing in one of the subjects special attainments, and shall present satisfactory theses, based upon an original scientific investigation.

The requirement of residence may be omitted in special cases by the Faculty.

The fee for either of these Diplomas is $10, payable before receiving it.

ADMISSION OF STUDENTS.

Applications for admission into the University should be made to the President, from whom all information may be obtained.

REGULAR STUDENTS.

All applicants for regular standing in the classes or schools must be prepared to pass an examination according to the programme of studies. From this it will be seen that a student may be admitted at any time if able to pass a satisfactory examination in the studies already pursued by his class. The only exception will be in the case of any young man who is very nearly but not thoroughly prepared to enter in full standing in any class. Such an one may, at the discretion of the Faculty, be admitted conditionally, to make up his deficiencies by extra study under their direction. When they are made up, he will be received in full standing in his class.

SPECIAL STUDENTS.

May enter, selecting such studies as they please, upon a satisfactory examination, with the sanction of the Faculty.

REQUIREMENTS FOR ADMISSION.

Applicants for admission into the first class must be at least *sixteen* years of age, and must present testimonials of good moral character.

SCHOOL OF GENERAL LITERATURE.

CLASSICAL COURSE.

Mathematics.—Arithmetic complete, including the Metric System. Olney's complete School Algebra, or Davies' new Bourdon's Algebra, through equations of the second degree. Chauvenet's Geometry, six books.

English.—Correct Spelling, to be determined by writing from dictation in idiomatic English. Geography. English Grammar. Physical Geography.

Latin.—A thorough knowledge of Latin Grammar. Cæsar's Commentaries, four books. Vigil's Æneid, four books. Cicero's four Orations against Catiline.

Greek.—A thorough knowledge of Greek Grammar is required. Xenophon's Anabasis, four books. Homer's Iliad, four books.

SCIENTIFIC COURSE AND THE TECHNICAL COURSES IN CIVIL, MECHANICAL AND MINING ENGINEERING, METALLURGY AND CHEMISTRY.

Mathematics.—Arithmetic complete, including metric system; Olney's complete School Algebra, or Davies' new Bourdon's Algebra, through equations of the second degree; first six books of Chauvenet's Geometry.

English.—Correct spelling, to be determined by writing from dictation in idiomatic English; Mitchell's School Geography; Parker's English Grammar; Mitchell's or Guyot's Physical Geography or equivalent.

PROGRAMME OF STUDIES.

SHOWING THE NUMBER OF HOURS AND EXERCISES PER WEEK FOR EACH SUBJECT, AND THE TEXT-BOOKS USED.

The following is presented as the general programme of instruction, subject to such modifications from time to time as the Faculty may deem expedient, with the approval of the Trustees.

The names of the Authors studied are also given. The number of Exercises per week in each subject is indicated by the figure in parenthesis immediately following.

Two hours of Drawing, three of work in the Laboratory, or three of practice in the field are regarded as equivalent to a recitation or lecture of one hour's duration.

THE SCHOOL OF GENERAL LITERATURE.

This school is intended to correspond, with some important differences, to the course long established in our older colleges, modified by the needs and requirements of modern culture. Its object is to impart a comprehensive and liberal education to those who design to enter upon professional rather than technical studies.

It comprises two distinct but parallel courses, I. The Classical Course. II. The Course in General Science.

THE CLASSICAL COURSE.

This school is chiefly designed for those who propose to study Law, and Theology; it includes full and vigorous instruction in the ancient classics, in elementary science and in General Literature. The study of Mathematics in this course embraces Algebra, Geometry, Trigonometry, Descriptive and Analytical Geometry, and the Calculus. The programme includes Physics, Chemistry and Elementary Mechanics. There are also full courses in History, on the Science of language and on the origin and growth of the English Language. There are also lectures on Psychology, the Christian Evidences, International and Constitutional Law and Political Economy. Lectures on English Literature are supplemented by critical readings of the standard English authors. Successful study in this course leads to the degree of B. A. (Bachelor of Arts).

THE COURSE IN GENERAL SCIENCE.

This course comprises most of the studies of the Classical Course, and is chiefly intended for those who, from circumstance or inclination, do not desire to study Latin and Greek. These being omitted, more extended instruction is given in French and German.

More time is also given to General Science. The instruction given in this Course, will be particularly valuable to those who design to enter upon commercial pursuits, or matters of general industry. The degree of B. Sc. (Bachelor of Science) is conferred upon the graduate in this course.

CLASSICAL COURSE.

FRESHMAN CLASS.

FIRST TERM.

Latin.—Livy: Books XXI. and XXII. Horace: Odes. Latin Composition. (4)

Greek.—Herodotus' Persian Wars, or Homer's Odyssey. Greek Composition. Classic Mythology. (4)

History.—Weber's Outlines of History. (2)

Mathematics.—Chauvenet's Geometry (completed). (4)

Essays and Declamations. (1)

Drawing. (1)

SECOND TERM.

Latin.—Cicero: De Senectute and de Amicitia. Latin Prosody. (4)

Greek.—Xenophon's Memorabilia of Socrates, or Cyropædia. Greek and Roman Antiquities. (4)

History.—Weber's Outlines of History. (2)

Mathematics.—Olney's University Algebra, Part III. (5)

Essays and Declamations. (1)

SOPHOMORE CLASS.

FIRST TERM.

Latin.—Tacitus; Agricola. (3)

Greek.—Demosthenes' Philippics, or the Universal History of Polybius. (4)

English.—Coppée's English Literature. (4)

Mathematics.—Plane and Spherical Trigonometry and Mensuration. Use of Logarithmic Tables: Olney's General Geometry. (4)

Essays and Original Orations. (1)

SECOND TERM.

Latin.—Horace: Satires and Epistles. (4)

Greek.—Euripedes: Medea or Alcestis. (3)

Rhetoric.—Coppée's Rhetoric. (2)

English.—Lectures on the Science of Language: Müller and Farrar. (2)

Mathematics.—Differential and Integral Calculus. Courtenay. (4)

Essays and Original Orations. (1)

JUNIOR CLASS.

FIRST TERM.

Latin.—Tacitus: Annals. (2)

Greek.—Plato's Gorgias. (2)

History.—Lectures. (4)

Logic.—Coppée's Logic. (3)

Fine Arts.—Lectures. (1)

Physics.—Deschanel's Mechanics and Lectures. With Laboratory Practice. (2)

Anatomy and Physiology.—Lectures. (1)

SECOND TERM.

Latin.—Satires of Juvenal: (2)

Greek.—Thucydides. (2)

History.—Lectures on the Philosophy of History. (2)

English.—Lectures on the English Language; Schele de Vere. (1)

Chemistry.—Lectures. Fownes' Elementary Chemistry. (3)

Physics.—Galvanism, Acoustics, Light. Deschanel with Lectures and Laboratory Practice. (5)

SENIOR CLASS.

FIRST TERM.

Latin.—Horace: Ars Poetica, or the Adelphi of Terence. (2)

Greek. —— ——. (2)

Christian Evidences.—Lectures. (1)

International Law and History.—Lectures. (1)

English Literature and History.—Lectures. (3)

Descriptive Astronomy.—Loomis Treatise, with Lectures. (3)

Physics.—Heat, Meteorology, Barometrical Levelling and Measurement of Heights, Magnetism and Statical Electricity. Lectures with Laboratory Practice. (3)

SECOND TERM.

Latin. Cicero de Officiis. (3)

Greek.—Demosthenes' and Æschines de Corona, or Æschylus' Prometheus Vinctus. (2)

Psychology.—Lectures. (2)

Political Economy.—Lectures. (1)

Constitutional Law and History.—Lectures. (2)

Chemistry.—Lectures and Laboratory Practice. Galloway's Qualitative Analysis. (3)

Geology.—Lectures. Dana. (2)

Preparation of Thesis.

SCIENTIFIC COURSE.

FRESHMAN CLASS.

FIRST TERM.

Mathematics.—Chauvenet's Geometry, (completed). (4)

French.—Fasquelle's Introductory French Course. Gibert's second French Reader. (3)

German.—Otto's Grammar. Writing in German Text. Translation into English. (4)

History.—Weber's Outlines of History. (2)

Elementary Drawing. (2)

Essays and Declamations. (1)

SECOND TERM.

Mathematics.—Olney's University Algebra, (Part III.) (5)

French.—Languillier's and Monsanto's Practical French Course. Chouquet's first Readings from Modern French Writers. (3)

German.—Otto's Grammar. Schlegel's second Classical German Reader. (2)

History.—Weber's Outlines of History. (2)

Drawing. (3)

Essays and Declamations. (1)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Plane and Spherical Trigonometry and Mensuration. Use of Logarithmic Tables. Olney's General Geometry. (4)

French.—Languillier's and Monsanto's Practical French Course. Chouquet's First Readings from Modern French writers. Practical Exercises in translation from French into English. (3)

German.—Otto's German Grammar, Schlegel's Second Classical Reader. Practical Exercises in Translation from German into English. (3)

English.—Coppée's English Literature. (4)

Drawing. (1)

Essays and Original Orations. (1)

SECOND TERM.

Mathematics.—Differential and Integral Calculus. Courtenay's. (4)

Descriptive Geometry.—General Orthographic Projections. Warren's Descriptive Geometry. (3)

French.—Poitevin: Grammaire Élémentaire, in French. Written Exercises. Chapsal: Leçons et Modèles de Littérature Française. (2)

German.—Scientific Readings. Exercises. (2)

Rhetoric.—Coppée's Rhetoric. (2)

English.—Lectures on the Science of Language. Müller and Farrar. (2)

Essays and Original Orations. (1)

JUNIOR CLASS.

FIRST TERM.

Physics.—Deschanel's Mechanics and Lectures, with Laboratory Practice. (2)

Anatomy and Physiology.—Lectures. (1)

French.—Poitevin, continued with Exercises. Systematic Scientific Readings. Chapsal continued. (2)

German.—Systematic Scientific Readings. Translations from German into English. Compositions in German. (2)

History.—Lectures. (4)

Logic.—Coppée's Logic. (3)

Fine Arts.—Lectures. (1)

SECOND TERM.

Chemistry.—Lectures. Fownes' Elementary Chemistry. (3)

Physics.—Galvanism. Acoustics. Light. Deschanel, with Lectures and Laboratory Practice. (5)

French.—Systematic Readings. Composition. Bougeault: Précis de la Littèrature Française. (2)

German.—Systematic Scientific Readings. Composition. Translations. Lectures on German Literature. (2)

History.—Lectures on the Philosophy of History. (2)

English.—Lectures on the English Language. Schele de Vere. (1)

SENIOR CLASS.

FIRST TERM.

Physics.—Deschanel's Heat, Magnetism and Statical Electricity. Barometrical Levelling and Measurement of Height. Lectures, with Laboratory Practice. (3)

Descriptive Astronomy.—Loomis' Treatise, with Lectures. (3)

Surveying.—Gillespie's Surveying. (2)

Crystallography.—Lectures with Practical Exercises in the Determination of Crystals. (2)

Christian Evidences.—Lectures. (1)

International Law.—Lectures. (1)

English Literature and History.—Lectures. (3)

SECOND TERM.

Chemistry. Lectures and Laboratory Practice. Galloway's Qualitative Analysis. (5)

Mineralogy.—Descriptive and Determinative, with Practice. E. S. Dana. (3)

Geology.—Lectures. Dana's Treatise. (2)

Psychology.—Lectures by the President. (2)

Political Economy.—Lectures. (1)

Constitutional Law and History.—Lectures. (2)

Preparation of Thesis.

TECHNICAL COURSES.

The first three terms (one year and a half) have the same curriculum of studies for all the Technical Schools. At the end of that time the student selects his course and follows the programme laid down for the School selected.

FRESHMAN CLASS.

FIRST TERM.

Mathematics.—Chauvenet's Geometry, (completed). (4)

Physics.—Deschanel's Mechanics and Lectures. With Laboratory Practice. (2)

French.—Fasquelle's Introductory French Course. Gibert's second French Reader. (3)

German.—Otto's Grammar. Writing in German Text. Translation of German into English. (4)

Elementary Drawing.—Warren. (2)

Essays and Declamations. (1)

SECOND TERM.

Mathematics.—Olney's University Algebra, (Part III.) (5)

Chemistry.—Lectures. Fownes' Elementary Chemistry. (3)

French.—Languillier's and Monsanto's Practical French Course. Chouquet's first Readings from Modern French Writers. (3)

German.—Otto's Grammar. Schlegel's second Classical German Reader. (2)

Drawing.—Warren's Projection Drawing. (2)

Essays and Declamations. (1)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Plane and Spherical Trigonometry and Mensuration. Use of Logarithmic Tables: Olney's General Geometry. (4)

Chemistry.—Lectures and Laboratory Practice. Galloway's Qualitative Analysis. (5)

Physics.—Heat, Meteorology, Barometrical Levelling and Measurement of Heights, Magnetism and Statical Electricity. Lectures, with Laboratory Practice. (3)

French, or German.—As in the Scientific Course of the School of General Literature. (3)

Essays and Original Orations. (1)

THE SCHOOL OF CIVIL (or Statical) ENGINEERING.

The general scope of this School comprises the higher branches of the applied mechanics and mathematics, together with the principles of construction and exercises in mapping, drawing and designing. Thus, the Student is made acquainted with the Theory of Elasticity or Flexure, including the strength of materials, the principles of construction of roof-trusses, beams, girders and bridges, as well as the practical designing of such structures, the determination of their proper dimensions and the preparation of working drawings. Under this head belong also the Theory of the Stability of Structures, including the theory of the arch and the construction of retaining walls; together with the Theory of Motion as applied to machines; the principles of Hydrostatics and Hydraulics with their applications to water-pressure engines, overshot, undershot and breast wheels, turbines, etc.

In all cases, practical examples, such as occur in actual engineering practice, are taken up and discussed, and, together with the analytical or algebraic methods, the student is also instructed in practical graphical solutions of the various problems, wherever such solutions present a special value in practice. Much time is devoted to geodetical operations and to actual practice and instruction in the Field. Profiles, Plans of Trigonometrical Surveys, Contour Maps and Town Surveys are made. Instruction is given in the practical operations connected with the reconnoissance, location and surveys of roads, canals and railroads, such as cross-sectioning, setting grade stakes, laying out of curves and calculation of excavation and embankment. Thorough instruction is given in Drawing, the construction of working drawings of structures, the designing of bridges and roofs, topography and hydrographical charts.

Attention is also paid to the *application* of the general principles of the science of Engineering, or to Engineering considered as an *art.* Under this latter head may be classed the composition and qualities of materials used in construction, iron, steel, wood, stone; their dressing and preservation; foundations, earth and rock-work; harbor and river improvements, drainage, collection and distribution of water, grading, paving, etc.

So much of Mechanical Engineering is necessarily included, as refers to the construction of bridges and canal locks, etc., and the special machinery and appliances used in the erection of structures.

Designs for, and reviews of, special structures, specifications and estimates of quantities and cost, and the preparation of a graduation Thesis giving evidence of satisfactory attainments, complete the course. The graduate of this School will receive the degree of C. E, (Civil Engineer.)

Graduates of the School of Civil Engineering, by remaining one year and pursuing the course of studies elsewhere laid down, may receive the degree of Mechanical Engineer (M. E.)

SCHOOL OF STATICAL ENGINEERING.

SOPHOMORE CLASS.

Mathematics.—Differential and Integral Calculus. Courtenay. (4)

Descriptive Geometry.—General Orthographic Projections. Warren. (3)

Drawing.—Elementary Topographical Drawing; Maps of Farm-Surveys. Smith. (1)

Surveying.—Chain and Compass Surveying—Theory and Practice. Farm Surveys. Gillespie. (3)

Physics.—Galvanism; Acoustics; Light. Deschanel with Lectures and Laboratory Practice. (5)

JUNIOR CLASS.

FIRST TERM.

Mathematics.—Integral Calculus. Courtenay. (2)

Mechanics.—Smith. Mathematical Theory of Motion; Science of Motion in General; Statics; Dynamics and Statics of Fluids; Lectures on Theory of Centre of Gravity and Moment of Inertia. (5)

Descriptive Geometry.—Warped Surfaces; Shades and Shadows, Linear Perspective. Warren. (3)

Surveying.—Use and Adjustment of Field Instruments; Levelling; Triangulation; Topographical Surveying; Hydrography; Theory and Practice. Gillespie. (3)

Topographical Drawing.—Profiles; Plans of Trigonometrical Surveys; Contour Maps. Smith. (2)

Crystallography.—Lectures. (2)

SECOND TERM.

Applied Mechanics.—Theory of Strains (Stoney); Lectures. (3)

Stereotomy.—Elements of Machine Drawing; Drawings of Structures; Working Drawings. Warren. (2)

Surveying.—Surveying with Plane Table; Mine Surveying; Town Surveying; Theory and Practice. Gillespie. (2)

Topographical Drawing.—Colored Topography; Hydrographical Charts; Plans and Profiles of Mines; Town Maps. (3)

Principles of Mechanism.—Willis. (3)

Mineralogy.—Descriptive and Determinative, with practice. E. S. Dana's. (3)

SENOIR CLASS.

FIRST TERM.

Applied Mechanics.—Theory of Flexure; Elasticity and Strength of Materials, including Forms of Uniform Strength; Stability of Structures; Theory of the Arch; Retaining Walls. Graphical Statics; Graphical Solutions of Statical Problems. Weisbach. (5)

Stereotomy.—Stone Cutting; Working Drawings. (2)

Surveying.—Theory of Reconnoisance; Preliminary and Location Surveys for Roads, Railroads, Canals; Henck's Field Book for Railroad Engineers; Preliminary Field Practice in Staking out Curves, Sidings, etc.; Field Work of the Location; Cross Sectioning; Setting Grade Stakes; Calculation of Earth Work; Final Estimates; Map and Profile of Location. Gillespie. (3)

Astronomy.—Descriptive Astronomy Loomis. (3)

Christian Evidences.—Lectures by the President. (1)

English Literature and History.—Lectures. (2)

SECOND TERM.

Applied Mechanics.—Theory of Trussed Frames; Bridges and Roofs; General Theory of Machines; Principles of Thermodynamics and Theory of the Steam Engine; Hydraulics and Hydraulic Motors. Wood. Reuleaux. (5)

Construction.—Materials of Structures; Dressing and Preservation of Materials; Foundations, Roofs, Bridges and Culverts; Construction of Roads, Railroads, Canals and Tunnels; Earth and Rock Work; Harbor and River Improvements; Farm and Town Drainage; Collection and Distribution of Water; Designs for and Reviews of Special Structures. Wood's Mahan. (2)

Stereotomy.—Stone Cutting. (1)

Steam Engine.—Rankine. (2)

Astronomy.—Practical Astronomy as applied to Geodesy and Navigation. Lectures and Observatory work. Determination of Latitude, Longtitude and Azimuth. Practice with the Sextant, Transit and Zenith Telescope. (2)

Geology.—Lectures. Dana. (2)

Psychology.—Lectures by the President. (2)

Preparation of Theses.

POST GRADUATE COURSE FOR MECHANICAL ENGINEERS, FOR THE DEGREE OF CIVIL ENGINEER.

FIRST TERM.

Surveying.—Theory of Reconnoissance; Preliminary and Location Surveys for Roads, Railroads, Canals; Henck's Field Book for Railroad Engineers; Preliminary Field Practice in Staking out Curves, Sidings, etc.; Field Work of the Location; Cross Sectioning; Setting Grade Stakes; Calculation of Earth Work; Final Estimates; Map and Profile of location. Gillespie. (3)

Stereotomy.—Stone Cutting; Working Drawing. (2)

Drawing.—Topographical Drawing; Map of Farm Survey; Profiles; Plans of Trigonometrical Surveys; Contour Maps. (3)

SECOND TERM.

Surveying.—Surveying with Plane Table; Mine and Town Surveying. Gillespie. (2)

Constructions.—Materials of Structures; Dressing and Preservation of Materials; Foundations, Roofs, Bridges and Culverts; Construction of Roads, Railroads, Canals and Tunnels; Earth and Rock Work in General; Harbor and River Improvements; Farm and Town Drainage; Collection and Distribution of Water; Warming and Ventilation; Estimates of Quantities and Cost; Specifications; Designs for and Reviews of Special Structures. Wood's Mahan. (2)

Stereotomy.—Stone Cutting. (1)

Drawing.—Colored Topography; Hydrographical Charts; Plans and Profiles of Mines; Town Maps. (3)

Astronomy.—Practical Astronomy as applied to Geodesy and Navigation. Lectures and Observatory work. Determination of Latitude, Longitude and Azimuth. Practice with the Sextant, Transit and Zenith Telescope. (2)

Preparation of Theses.

THE SCHOOL OF MECHANICAL (or Dynamical) ENGINEERING.

While the problems which the Civil Engineer is called upon to solve are mainly *statical* problems, involving the idea of rest or equilibrium, and the ends to be obtained in his constructions are stiffness, rigidity and immobility; the object of the Mechanical or Dynamical Engineer, on the other hand, is not to avoid or prevent, but to *cause* motion, not to oppose the action of the forces of nature, but so to guide and use them as to obtain the desired results in the best manner and with the least expenditure of force and material. The two sciences are thus, in the nature of the problem with which they have to do, to a certain extent antithetical. The sciences, however, of which both make use, and the fundamental principles, by the application of which the desired results are in each case obtained, are, to a considerable extent, identical.

Thus, the higher branches of the mathematics and of applied mechanics, as well as the principles of constructions, are common to both Schools. So also as regards the Theory of Elasticity or Flexure and the Strength and Properties of Materials. Much, therefore, of the course as already indicated for the School of Civil Engineering, finds here also a place, as will appear from an examination of the more detailed course of study which is elsewhere given.

In the practical *application* of the principles common to both, however, the two Schools diverge. Thus special attention is directed to the applications of the principles of mechanics to machinery, in the construction of stationary, locomotive and marine engines, hydraulic motors of various kinds, blast furnaces and their appurtenances, foundries, rolling-mills and steel works. Information is afforded of the methods of casting and working in iron and other metals, and of making and using the tools employed in these processes.

Much attention is paid to the execution of working drawings, and to the Theory of Mechanism. The proximity of numerous blast furnaces, rolling mills, foundries, machine shops and factories, enables the student to see the practical workings of such establishments and to obtain valuable practical information in the various branches of mechanical engineering.

Visits of inspection to the workshops, mills and blast furnaces in the neighborhood, with explanations of the machinery and tools used, form an important feature of the course.

The graduate in this School will receive the degree of M. E., (Mechanical Engineer).

Graduates of the School of Mechanical Engineering, by remaining an additional year and pursuing the course of studies elsewhere laid down, may receive the degree of C. E., (Civil Engineer).

THE SCHOOL OF MECHANICAL (or Dynamical) ENGINEERING.

SOPHOMORE CLASS.

SECOND TERM.

Mathematics.—Differential and Integral Calculus. Courtenay. (4)

Descriptive Geometry.—General Orthographic Projections. Warren. (3)

Surveying.—Chain and Compass Surveying. Theory and Practice. Farm Surveys. Gillespie. (3)

Physics.—Galvanism; Acoustics; Light. Deschanel, with Lectures and Laboratory Practice. (5)

Blow-pipe Analysis.—Lectures with Practice. Plattner. Brush or Nason and Chandler. (1)

JUNIOR CLASS.

FIRST TERM.

Mathematics.—Integral Calculus. Courtenay. (2)

Mechanics.—Smith. Mathematical Theory of Motion; Science of Motion in general; Statics; Dynamics and Statics of Fluids; Lectures on Theory of Centre of Gravity and Moment of Inertia. (5)

Descriptive Geometry.—Warped Surfaces; Shades and Shadows, Linear Perspective. Warren. (3)

Surveying.—Use and Adjustment of Field Instruments; Levelling; Triangulation; Topographical Surveying; Hydrography. Theory and Practice. Gillespie. (3)

Stereotomy.—Elements of Machine Drawing; Drawings of Structures; Working Drawings. Warren. (2)

Crystallography.—Lectures. (1)

SECOND TERM.

Principles of Mechanism.—Willis. (3)

Machine Drawing.—Sketches of Complete Machines; Working Drawings of Simple Machines; Finished and Working Drawings of Special Machines; Construction of Machines from actual measurements (2)

Practical Mechanism.—Lectures in the Workshop; Machine Tools; Planing; Turning, etc. (Shelley, Pole, Bourne.) (2)

Applied Mechanics.—Theory of Strains (Stoney); Lectures. (3)

Metallurgy.—Metallurgical Processes, Furnaces; Refractory Building Materials; Combustion; Natural and Artificial Fuels; Metallurgy of Iron. (3)

Mineralogy.—Descriptive and Determinative, with Practice. E. S. Dana. (3)

SENIOR CLASS.

FIRST TERM.

Applied Mechanics.—Theory of Flexure; Elasticity and Strength of Materials, including Forms of Uniform Strength; Stability of Structures; Theory of the Arch; Retaining Walls. Graphical Statics; Graphical Solutions of Statical Problems. Weisbach. (5)

Theory of Mechanism.—Mill Work. Rankine. (3)

Practical Mechanism.—Lectures on Forging, Riveting; Pattern Making and Moulding, with Practice in the Workshop; Visits of Inspection. (2)

Astronomy.—Descriptive Astronomy. Loomis. (3)

Christian Evidences.—Lectures by the President. (1)

English Literature and History.—Lectures. (2)

SECOND TERM.

Applied Mechanics.—General Theory of Machines; Principles of Thermo-dynamics and Theory of the Steam Engine; Hydraulics and Hydraulic Motors. Wood. Reuleaux. (5)

Theory of Mechanism.—Link and Valve Motion Zeuner. (2)

Steam Engine—Rankine. (2)

Practical Mechanism.—Setting up and Fitting; Lectures. (1)

Machine Drawing.—Finished and Working Drawings of Special Machines. (1)

Geology.—Lectures. Dana. (2)

Psychology.—Lectures by the President. (2)

Preparation of Theses.

POST GRADUATE COURSE FOR CIVIL ENGINEERS FOR THE DEGREE OF MECHANICAL ENGINEER.

FIRST TERM.

Theory of Mechanism.—Mill Work. Rankine. (3)

Practical Mechanism.—Lectures on Forging, Riveting; Pattern Making and Moulding, with Practice in the Workshop; Visit of Inspection. (2)

Stereotomy.—Warren's Machine Drawing, Theory and Plates; Sketches and Working Drawings of parts of Machinery. (2)

Blow-pipe Analysis.—Lectures with Practice. (1)

SECOND TERM.

Theory of Mechanism.—Link and Valve Motion. Zeuner. General Theory of Machines. Reuleaux. (3)

Practical Mechanism.—Lectures in the Workshop; Machine Tools; Planing; Turning; Setting up and Fitting, etc. (Shelley, Pole, Bourne.) (3)

Machine Drawing.—Sketches of Complete Machines; Working Drawings of Simple Machines; Finished and Working Drawings of Speeial Machines; Construction of Machines from actual measurements; Finished and Working Drawings of Special Machines. (3)

Metallurgy.—Metallurgical Processes; Furnaces; Refractory Building Materials; Combustion; Natural and Artificial Fuels; Metallurgy of Iron. (3)

Preparation of Theses.

THE SCHOOL OF MINING AND METALLURGY.

The full course in this School comprises, besides the Mathematical, Physical, Chemical and Literary studies necessary to all technical education, courses in Mining, Metallurgy, Geology, Mineralogy, Machines, qualitative and quantitative Analysis, Assaying, Blowpipe Analysis, Topographical and Mine Surveying and Drawing. On account of the great number and scope of the studies necessary to the completion of the full course, it is four years and a half in length.

The graduate in this School, who has taken the full course, will receive the degree of E. M., (Engineer of Mines).

A partial course may be taken in this School by those who wish to pursue the study of Metallurgy. The course of Metallurgy includes the studies of the full course, except those of Mining and Surveying. The length of the course is four years.

The graduate of this School in the Metallurgical course will receive the degree of Metallt., (Metallurgist).

A Post Graduate course has been arranged in this School, comprising courses in Mining, Metallurgy, Chemical Analysis and Blowpipe Analysis, with supplementary courses in Geology and Mineralogy.

Graduates in the School of Civil Engineering, by remaining one year and taking this course, may obtain the degree of E. M.

In the courses of Mineralogy, Geology and Analytical Chemistry, much attention is paid to the practical instruction of the student in determining minerals by their crystallographical and physical properties, and by the aid of blow-pipe analysis, in the determination of rocks; in the qualitative and quantitative examination of ores and metallurgical products and in the rapid methods of assaying ores by the dry and wet ways employed in metallurgical laboratories. The vicinity to the iron works of the Lehigh Valley and especially to the works of the Bethlehem Iron Company, with its blast furnaces, foundry and machine shops, and Bessemer, puddle, iron and steel rail mills, affords unusual facilities for the practical study of iron metallurgy. The processes of the manufacture of spelter and oxide of zinc may be studied at the works of the Lehigh Zinc Company. The facilities for the practical study of mining and economic geology are hardly less great. The mines of the Lehigh Zinc Company and the brown hematite and slate deposits of the Lehigh Valley are in the immediate vicinity, while within easy reach by rail are the anthracite coal fields of Pennsylvania, the iron and zinc mines of New Jersey, and the celebrated iron mines at Cornwall, Pa.

THE SCHOOL OF MINING AND METALLURGY.

SOPHOMORE CLASS.

SECOND TERM.

Mathematics.—Differential and Integral Calculus. Courtenay. (4)

Descriptive Geometry.—General Orthographic Projections. Warren. (3)

Surveying.—Chain and Compass Surveying—Theory and Practice. Farm Surveys. Gillespie. (2)

Physics.—Galvanism, Acoustics and Light. Deschanel with Lectures and Laboratory Practice. (5)

Blow-Pipe Analysis.—Lectures and Practice. Plattner, Brush, or Nason and Chandler. (1)

Assaying.—Including the Assay by the Dry Methods of Gold, Silver, Copper, Lead, Iron and Tin Ores. Laboratory Work. Ricketts. (1)

JUNIOR CLASS.

FIRST TERM.

Mechanics.—Smith. Mathematical Theory of Motion; Science of Motion in general; Statics; Dynamics and Statics of Fluids; Lectures on Theory of Centre of Gravity and Moment of Inertia. (5)

Surveying.—Use and Adjustment of Field Instruments; Levelling; Triangulation; Topographical Surveying; Hydrography. Theory and Practice. Gillespie. (3)

Topographical Drawing.—Profiles; Plans of Trigonometrical Surveys; Contour Maps. Smith. (2)

Crystallography.—Lectures with Practical Exercises in the Determination of Crystals. (2)

Chemical Philosophy.—Cooke. (4)

SECOND TERM.

Surveying.—Surveying with Plane Table; Mine Surveying; Town Surveying; Theory and Practice. Gillespie. (2)

Metallurgy.—Metallurgical Processes; Furnaces; Refractory Building Materials; Combustion; Natural and Artificial Fuels; Metallurgy of Iron. (3)

Mineralogy.—Descriptive Mineralogy, with Practical Exercises in the Determination of Minerals. E. S. Dana. (3)

Blow-Pipe Analysis.—Practice. (1)

Chemical Philosophy.—Cooke. (4)

Chemistry.—Quantitative Analysis; Laboratory Practice. (3)

SENIOR CLASS.

FIRST TERM.

Applied Mechanics.—Theory of Flexure; Elasticity and Strength of Materials, including Forms of Uniform Strength; Stability of Structures; Theory of the Arch; Retaining Walls. Weisbach. (3)

Geology.—Lithology, with Practical Exercises in the Determination of Rocks. Lectures. (3)

Metallurgy.—Of Copper, Lead, Silver, Gold, Platinum, Mercury, Tin, Zinc, Nickel, Cobalt, Arsenic, Antimony and Bismuth. (4)

Chemistry. — Quantitative Analysis; Laboratory Work. Fresenius. (3)

Astronomy.—Descriptive Astronomy. Loomis. (3)

SECOND TERM.

Applied Mechanics.—General Theory of Machines; Principles of Thermodynamics and Theory of the Steam Engine; Hydraulics and Hydraulic Motors. Wood. Reuleaux. (4)

Steam Engine.—Rankine. (2)

Mining.—Modes of Occurrence of the Useful Minerals; Searching for Mineral Deposits; Examination of Mining Properties; Boring; Mining Tools, Machines and Processes; Timbering and Masonry; Methods of Exploitation. Callon. André. (3)

Geology.—Historic, Dynamic aad Economic Geology. Dana. (3)

Astronomy.—Practical Astronomy as applied to Geodesy and Navigation. Lectures and Observatory Work. Determination of Latitude, Longitude and Azimuth. Practice with the Sextant, Transit and Zenith Telescope. (2)

Psychology.—Lectures by the President. (2)

FIFTH YEAR.

FIRST TERM.

Mining.—Underground Transportation; Hoisting; Drainage and Pumping; Ventilation and Lighting; Mechanical Preparation of Ores; Coal Washing. Callon. André. (4)

Chemistry.—Quantitative Analysis. (6)

Christian Evidences.—Lectures by the President. (1)

English Literature and History.—Lectures. (2)

Preparation of Theses.

METALLURGICAL COURSE.

SOPHOMORE CLASS.

SECOND TERM.

Mathematics.—Differential and Integral Calculus. Courtenay. (4)

Descriptive Geometry.—General Orthographic Projections. Warren. (3)

Physics.—Galvanism; Acoustics; Light. Deschanel with Lectures and Laboratory Practice. (5)

Blow-pipe Analysis.—Lectures and Practice. Plattner, Brush or Nason and Chandler. (1)

Assaying.—Including the Assay by the Dry Methods of Gold, Silver, Copper, Lead, Iron and Tin Ores. Laboratory Work. Ricketts. (1)

Structure Drawing.—Furnaces and Metallurgical Apparatus. (2)

JUNIOR CLASS.

FIRST TERM.

Mechanics.—Smith. Mathematical Theory of Motion; Science of Motion in general; Statics; Dynamics and Statics of Fluids; Lectures on Theory of Centre of Gravity and Moment of Inertia. (5)

Chemical Philosophy.—Cooke. (4)

Chemistry.—Quantitative Analysis; Laboratory Work. Fresenius. (3)

Crystallogrophy.—Lectures with Practical Exercises in the Determination of Crystals. (2)

Machine Drawing.—Warren's Machine Drawing, Theory and Plates; Sketches and Working Drawing of Parts of Machinery. (2)

SECOND TERM.

Principles of Mechanism.—Willis. (3)

Metallurgy.—Metallurgical Processes, Furnaces; Refractory Building Materials; Combustion; Natural and Artificial Fuels; Metallurgy of Iron. (3)

Mineralogy.—Descriptive Mineralogy, with Practical Exercises in the Determination of Minerals. E. S. Dana. (3)

Blow-pipe Analysis.—Practice. (1)

Chemical Philosophy.—Cooke. (4)

Machine Drawing.—Sketches of Complete Machines; Working Drawings of Simple Machines; Finished and Working Drawings of Special Machines; Construction of Machines from actual measurements. (2)

SENIOR CLASS.

FIRST TERM.

Applied Mechanics.—Theory of Flexure; Elasticity and Strength of Materials, including Forms of Uniform Strength; Stability of Structures; Theory of the Arch; Retaining Walls. Weisbach. (3)

Metallurgy.—Of Copper, Lead, Silver, Gold, Platinum, Mercury, Tin, Zinc, Nickel, Cobalt, Arsenic, Antimony and Bismuth. (4)

Chemistry.—Quantitative Analysis; Laboratory Work. (3)

Geology.—Lithology, with practical exercises in the determination of rocks. Lectures. (3)

Christian Evidences.—Lectures by the President. (1)

English Literature and History.—Lectures. (2)

SECOND TERM.

Applied Mechanics.—General Theory of Machines; Principles of Thermodynamics and Theory of the Steam Engine; Hydraulics and Hydraulic Motors. Wood. Reuleaux. (4)

Theory of Mechanism.—Link and Valve Motion. Zeuner. (2)

Steam-Engine.—Rankine. (2)

Chemistry.—Quantitative Analysis, Laboratory Work. (3)

Geology.—Historic, Dynamic and Economic Geology. Lectures. Dana. (3)

Psychology.—Lectures by the President. (2)

Preparation of Theses.

POST GRADUATE COURSE FOR CIVIL ENGINEERS FOR THE DEGREE OF MINING ENGINEER.

FIRST TERM.

Mining.—Underground Transportation; Hoisting; Drainage and Pumping; Ventilation and Lighting; Mechanical Preparation of Ores; Coal Washing. (4)

Geology.—Lithology, with Practical Exercises in the Determination of Rocks. Dana. (1)

Metallurgy.—Of Copper, Lead, Silver, Gold, Platinum, Mercury, Tin, Zinc, Nickel, Cobalt, Arsenic, Antimony and Bismuth. (4)

Chemistry.—Quantitative Analysis; Laboratory Work. (6)

Crystallography.—Practical Exercises in the Determination of Crystals. E. S. Dana. (1)

SECOND TERM.

Mining.—Modes of Occurrence of the Useful Minerals; Searching for Mineral Deposits; Examination of Mining Properties; Boring; Mining Tools, Machines and Processes; Timbering and Masonry; Methods of Exploitation. (4)

Metallurgy.—Metallurgical Processes; Furnaces; Refractory Building Materials; Combustion; Natural and Artificial Fuels; Metallurgy of Iron. (3)

Geology.—Historic, Dynamic and Economic Geology. Dana. (3)

Chemistry.—Quantitative Analysis; Laboratory Work. (3)

Assaying.—Including the Assay by the Dry Methods of Gold, Silver, Copper, Lead, Iron and Tin Ores. Ricketts. (1)

Blow-Pipe Analysis.—Practice. (2)

THE SCHOOL OF CHEMISTRY.

The course of instruction in this School continues the subject of Theoretical Chemistry from the general course of the two previous terms, the subjects of Chemical Philosophy and Organic Chemistry being taught by daily recitations until the close of the Junior year.

In Analytical Chemistry, the course of Qualitative Analysis in the first term of the second year is followed by preparation of Chemical Compounds and the Purification of Chemicals.

Subsequently, Quantitative Analysis is pursued to the end of the course, including the Dry Assaying of Ores of Gold, Silver, Copper, Lead, Iron and Tin, and the Wet Analyses, included in the appended schedule. In addition, courses of Lectures on Medical, Agricultural and Technical Chemistry are given, and various industrial establishments in the neighborhood and in Philadelphia and New York are visited, in the company of an instructor. The course also includes thorough instruction in Physics and Mechanics, Mineralogy and Blow-pipe Analysis, Metallurgy, Geology and Descriptive Astronomy.

The last term of the Senior year is mainly devoted to the preparation of a Thesis on some subject, selected by the Professor, involving practical work in the Laboratory, in addition to the literary labor, and each graduate will thus make a contribution to the progress of the science as a preliminary to the reception of his degree.

The course is thus seen to include thorough instruction in theoretical and applied chemistry, in their various branches, as well as in those cognate and other sciences of such great value to the chemist.

The Laboratories are under the immediate charge of the Professor and his Assistant, and, together with the lecture-room, are unsurpassed in excellence by any similar establishment in the country, being supplied with all the modern improvements. The collections of apparatus, specimens and models, illustrating theoretical and applied chemistry, are already important and rapidly increasing.

Students are charged for the chemicals and apparatus consumed. If the student is moderately careful, this expense need not exceed $60 per year.

The graduate in this School will receive the degree of A. C., (Analytical Chemist).

THE SCHOOL OF CHEMISTRY.

SOPHOMORE CLASS.

SECOND TERM.

Mathematics.—Differential and Integral Calculus. Courtenay. (4)

Descriptive Geometry.—General Orthographic Projections. Church. (3)

Physics.—Galvanism; Acoustics; Light. Deschanel, with Lectures and Laboratory Practice. (5)

Chemical Preparations.—Including the Preparation of Chemical Compounds and the Purification of Chemicals by Distillation, Sublimation, Fusion, Crystallization, Precipitation, etc. (1)

Assaying.—Including the Assay by the Dry Methods of Gold, Silver, Copper, Lead, Iron and Tin Ores. Ricketts. (1)

Blowpipe Analysis.—Lectures with Practice. Plattner, Brush, or Nason and Chandler. (1)

JUNIOR CLASS.

FIRST TERM.

Chemical Philosophy.—Cooke. (4)

Toxicology.—Otto on Poisons. (1)

Quantitative Analysis.—Fresenius' Quantitative Analysis. (7) The following analyses are executed by the students:

1. Iron Wire (Fe.)
2. Potassic Dichromate (Cr_2O_3.)
3. Baric Chloride (Ba. Cl. H_2O.)
4. Magnesic Sulphate (MgO. SO_3. H_2O.)
5. Hydro Di-Sodic Phosphate (P_2O_5)
6. Bronze (Cu. Sn. Zn.)
7. Rochelle Salt (K_2O. Na_2O.)
8. Volumetric Determination of Chlorine.
9. Acidimetry (HCl. H_2SO_4. HNO_3.)
10. Alkalimetry (KOH. NaOH. NH_4OH.)
11. Chlorimetry (Bleaching Powders.)
12. Silver Coin (Au. Ag. Pb. Cu.)
13. Zinc Ore (Zn.)

Crystallography.—Lectures with Practical Exercises in the Determination of Crystals. (2)

Anatomy and Physiology.—Lectures. (1)

SECOND TERM.

Chemical Philosophy.—Cooke. (4)

Quantitative Analysis.—Fresenius' Quantitative Analysis. (5) The following analyses are executed by the students.

14. Copper Ore (Cu.)
15. Spiegeleisen. (Mn).
16. Lead Ore (Pb.S.)
17. Ilmenite (TiO_2.)
18. Iron Ore (Complete Analysis.)
19. Limestone (Complete Analysis.)

20. Coal (Volatile Matter,—Fixed Carbon, Ash, H_2O, S., P.)

21. Slag (Complete Analysis.)

Metallurgy.—Metallurgical Processes, Furnaces; Refractory Building Materials; Combustion; Natural and Artificial Fuels; Metallurgy of Iron. (3)

Mineralogy.—Descriptive Mineralogy, with Practical Exercises in the Determination of Minerals. E. S. Dana. (3)

SENIOR CLASS.

FIRST TERM.

Organic Chemistry.—Wöhler. (4)

Quantitative Analysis.—Fresenius' Quantitative Analysis. (5) The following analyses are executed by the students:

22. Guano (NH_3. P_2O_5. H_2O.)

23. Clay (Complete Analysis.)

24. Manganese Ore (MnO_2.)

25. Mineral Water (Complete Analysis)

26. Pig Iron (Complete Analysis.)

27. Nickel Ore (Ni.Co.)

28. Organic Analysis (C. H. O. N.)

29. Gas Analysis (Complete Analysis of Illuminating Gas.)

Astronomy.—Descriptive Astronomy. Loomis. (3)

Christian Evidences.—Lectures by the President. (1)

English Literature and History.—Lectures. (2)

SECOND TERM.

Chemistry Applied to the Arts.—Lectures. (3)

Medical Chemistry.—Lectures. (1)

Agricultural Chemistry.—Lectures. (1)

Geology.—Historic, Dynamic and Economic Geology. Lectures. Dana. (2)

Psychology.—Lectures by the President. (2)

Preparation of Thesis.

OBSERVATORY.

By the liberality of Robert H. Sayre, Esq., one of the Trustees of the University, an Astronomical Observatory has been erected on the University grounds, and placed under the charge of the Professor of Mathematics and Astronomy.

In the dome of the observatory is mounted an Equatorial Telescope, of six inches aperture, by Alvan Clark & Sons. The west wing contains a superior Sidereal Clock, by Wm. Bond & Sons; a Zenith Telescope by Blunt, and a Field Transit by Stackpole. There is also a Prismatic Sextant, by Pistor & Martins.

Students in practical Astronomy receive instruction in the use of the instruments and in actual observation.

The grounds upon which the Observatory stands, consisting of seven acres of land adjoining the original grant, were presented to the University by Charles Brodhead, Esq., of Bethlehem.

An advanced course in Astronomy and the higher Analysis has been established, requiring two years for its completion.

It is adapted to the attainments of the graduates of this University, but is open to any one who may be prepared to pursue it.

This course embraces the following subjects:

First Year — Spherical Astronomy. Theory of Instruments. Method of Least Squares. Numerical Calculus.

Second Year—Celestial Mechanics. Interpolation and Quadrature. Computation of Orbits and Perturbations.

During the entire course, the student will have ample opportunity to familiarize himself with the practical work of the Observatory and Computing Room.

SOCIETIES.

THE CHEMICAL AND NATURAL HISTORY SOCIETY OF THE LEHIGH UNIVERSITY.

This Society was organized in the Fall of 1871, as "The Chemical Society," but was afterwards expanded, as its present title indicates, and admits, by election, students from all departments of the University. The Reading Room is well supplied with scientific periodicals, including eighteen of the principal English and American journals.

The collections of Chemical Preparations, and of Botanical and Zoölogical Specimens belonging to the Society, are already important. During the past years persons have been sent to Texas and Brazil to collect specimens for these cabinets.

The Society has organized and maintained several courses of public scientific lectures.

Among the honorary members of the Society are more than one hundred of the most distinguished scientists in Europe and the United States.

THE ENGINEERING SOCIETY.

This Society, established and organized in February, 1873, under the auspices of the Professor of Engineering, is designed especially for the benefit of students in Civil, Mechanical and Mining Engineering.

In its collection of photographs and details, Mechanical Engineering is well represented by Locomotives, Machines and Tools; Civil Engineering by Bridges, Aqueducts, &c, while the section of Mining and Metallurgy is designed to be completely illustrated by mining and metallurgical plans Meetings are held twice a month when subjects on Engineering and other scientific topics are discussed.

GRADUATING THESES.

Every student, in each of the Schools, will be required to present a thesis upon some topic connected with his special School, as a necessary portion of the exercises for his final examination for a diploma. These theses shall be accompanied by drawings and diagrams, when the subject needs such illustration. The originals will be kept by the University, as a part of the student's record, for future reference; but a copy may be retained by the student, and be published, permission being first obtained from the President.

UNIVERSITY DAY AND EXHIBITIONS.

The day following the close of the Annual Examination shall be known as UNIVERSITY DAY. Upon this day the "Annual Exhibition of Graduates" shall take place in the presence of the Trustees, Faculty and invited guests. The exercises shall consist of orations and essays by members of the Senior Class. Every student must perform the duty assigned to him, unless excused by the President.

THESIS DAY.

On the day preceding University Day, the Theses will be publicly read by the graduating students.

The University Sermon will be preached on the Sunday before University Day, under the direction of the President.

RESIDENT GRADUATES.

Graduates who desire to pursue their studies under the direction of the Faculty, may be allowed the use of the Library, and may attend the lectures in any of the Departments. Although not bound by University hours, they will be required to obey the directions of the President and of the Professors in reference to their departments, and will have their names placed upon the Annual Register.

AWARD ON UNIVERSITY DAY.

The Wilbur Scholarship (value $200) was awarded, in 1877, to R. H. Tucker, Jr., of the Sophomore Class. This Scholarship, founded in 1872, by E. P. Wilbur, Esq., of South Bethlehem, is awarded annually to that student of the Sophomore Class having the best record.

THE UNIVERSITY SERMON

Was preached in the University Chapel on Sunday, June 17th, by Rev. William F. Morgan, D.D., St. Thomas' Church, New York.

GRADUATING THESES OF THE CLASS OF 1877

Were read on Wednesday morning, June 20th, at 8.30 o'clock, as follows:

IN CIVIL ENGINEERING.

1. Theory of the Reconnoissance and Location of Railroads with Calculation of Excavation and Embankment and Field Practice.
John Eagley.

2. Discussion of the Theory and Construction of Retaining Walls.
Percival Giess.

3. Review of Lehigh Valley Bridge at Easton, Pa.
A. M. Glassell.

4. Discussion of the Theory and Construction of the St. Louis Bridge.
George M. Heller.

5. A Comparison between the Simple and Continuous Girder as applied to the Poughkeepsie Bridge.
H. S. Jacoby.

6. Review of the Phœnix Iron Co.'s Bridge over French Creek at Phœnixville, Pa.

Seizo Miyahara.

7. Review of a Wrought Iron Bridge across the Potomac River at Powell's Bend.

James Fremont Marstellar.

8. On the Construction of Light Houses, together with a Review of the Spectacle Reef Light House on Lake Huron.

Lewis T. Wolle.

IN ANALYTICAL CHEMISTRY.

1. On the Radiometer and its Application to Photometry.

Charles R. Rauch.

2. Discussion of a new Process for the Manufacture of White Lead and Comparison of Commercial Samples.

George G. Converse.

3. Examination of an Equine Calculus.

Frederic M. Warner.

LIST OF DONATIONS

TO THE

VARIOUS DEPARTMENTS OF THE LEHIGH UNIVERSITY.

TO THE GENERAL LIBRARY.

From the Department of the Interior.

U. S. Geological Survey of the Territories, Vol. XI.

Monograph of North American Rodentia.

Bulletin of U. S. Geological and Geographical Survey of the Territories. Vol. III. Nos. 1, 2, 3, 4.

Bulletin U. S. Entomological Commission. Nos. 1, 2.

U. S. Geological Survey. F. V. Hayden. Report for 1875.

U. S. Geological Survey. List of Elevations.

U. S. Geological Survey. Ethnography and Philology of the Hidatsa Indians, 1877.

U. S. Geological Survey. Fur-Bearing Animals.

U. S. G and G. Survey of the Rocky Mountain Region.

Contributions to N. A. Ethnology Vol. I.

Special Report on Ontario Educational Exhibit.

Mines and mineral Statistics of New South Wales.

Report on Railroads of New South Wales.

From Treasury Department.

Annual Report of Secretary of the Treasury.

Mineral Resources West of the Rocky Mountains.

From U. S. Coast Survey.

Researches for the use of The Coast Pilots. Part I.
U. S. Coast Survey. Meteorological.
U. S. Coast Survey Report. 1874.

Conchologia Cestrica. W. D. Hartman.

Report of Meteorological, Magnetic and other observations of Dominion of Canada. Dec. 1876.

Money and Legal Tender.

History of Church in Burlington. Dr. Hills.

Formulae for R. R. Earth Work. Davis.

From Rear Admiral Thornton A. Jenkins.

International Exhibit. Navy Department Exhibit.

Brazilian Biographical Annual. Vols. I., II , III.

From Bureau of Education.

Special Report on Public Libraries in U. S. Part II.

From Smithsonian Institute.

Bulletin of U. S. National Museum. Nos. 4, 7, 8, 9.

Classification of the Collection to illustrate Animal Resources of U.S.

Atti della R. Accademia Dei Lincei, for 1876–77. Vol. I. Dec. 1876. January, February, March, April 1877–78.

Sixth Report of the Commission on River Pollution. Domestic Water Supply of Great Britain.

The Draining of Lake Fucino, accomplished by Prince Alexander Torlonia.

Catalogue British Section. International Exhibition, Philadelphia.

From David A. Williams, Proprietor.

"Iron Age," for year.

From James M. Swank, Esq., Secy.

Bulletin American Iron and Steel Association.

Patent Office Reports.

TO THE READING ROOM.

There have been provided for the Reading Room the following Periodicals:

London Quarterly Review, British Quarterly Review, Edinburgh Quarterly Review, Contemporary Review, International Review, North American Review, American Church Review, Blackwood's Magazine, Journal of the Franklin Institute, Metallurgical Review, Silliman's Journal, Van Nostrand's Eclectic Engineering Magazine, Nature—London, Athenæum—London, Spectator—London, Nation—New York, New England Journal of Education, Bethlehem Daily Times, American Exchange Review, American Chemist, American School Journal, Iron Age, The Engineering and Mining Journal.

TO THE DEPARTMENT OF MATHEMATICS AND ASTRONOMY.

From the U. S. Naval Observatory, Washington, D. C.

Publications.

From the Cincinnati Observatory.

Publications.

From the Observatory of Harvard College.

Publications.

From the U. S. Coast Survey.

Publications.

From the Smithsonian Institution.

Publications.

From the American Ephemeris and Nautical Almanac Officer.

Publications.

TO THE DEPARTMENT OF GEOLOGY.

From Prof. J. P. Kimball.

A suite of Iron Ores, Coals and Furnace Products illustrating the Iron Industry of the Hanging-Rock Iron Districts of Ohio and Kentucky.

A suite of the Iron Ores and Minerals from the Tilly Foster Mine, Putnam Co., N. Y.

TO THE DEPARTMENT OF CIVIL AND MECHANICAL ENGINEERING.

From Prof. A. J. Du Bois, C.E., Ph.D.

Translation of Weisbach's Hydraulics and Hydraulic Motors.

TO THE DEPARTMENT OF MINING AND METALLURGY.

From the Board of Commission of the Second Geological Survey of Pennsylvania.

Reports L., CC., and HH. of the Second Geological Survey of Pennsylvania.

From John George, Esq., Mine Hill, N. J.

Chalcophanite, Willemite and Jeffersonite from Mine Hill and Stirling Hill, N. J.

From E. H. Williams, Jr., E.M., A.C., Wilkesbarre.

Soda Nitre in Basalt, from Idaho.

From Wm. Th. Roepper, Esq., Bethlehem, Pa.

Rhodonite and Dipsolite from Stirling Hill, N. J.

From N. B. Wittman, Esq., Lanark.

Limonite.

From Prof. J. P. Kimball.

Goethite from Jackson Mine, Lake Superior.

From Prof. F. Prime, Jr., Easton.

Calcite Pseudomorphs after Gaylussite and Phosgenite.
Crystals of Staurolite.
Specimen of Jotham and Newton's prepared fuel.

From Robert H. Sayre, Esq.

Chlorite Pseudomorph after Garnet, from Lake Superior.
Crystallized Copper, from Lake Superior.

From John M. Hartmann, Esq., Nevada.

Wulfenite from Tecomah Mine, Nevada.

From Frank Howe, Esq.

Specimen of Loiseau's compressed fuel.
Ferromanganese.

From Prof. W. D. Marks, Philadelphia.

Native Zinc from Tennessee.

From Howland Russell, Esq., New York.

Crystals of Hematite from Elba.

From Charles L. Taylor, E.M., Johnstown, Pa.

Suite of specimens illustrating the Welsh process of smelting Copper ores, and the Hunt and Douglass wet process for the extraction of Copper, from Phœnixville, Pa.

From Henry Richards, E.M., Dover, N. J.

Slickensides from an iron mine in New Jersey.

From F. L. Clerc. C.E., Bethlehem.

Zinc Blende.

TO THE DEPARTMENT OF CHEMISTRY.

From Prof. C. F. Chandler, New York.

Model of a Human Heart; specimens of celluloid and casein; Lactometer.

From N. B. Wittman, Esq., Lanark.

Two specimens of Limonite.

From R. A. Packer. Esq., Sayre.

Boiler Incrustation.

From Nathan Bartlett, Esq., Bethlehem, Pa.

Specimens of Smithsonite.

From Robert H. Sayre, Esq

Three specimens native Copper; one specimen native silver; two specimens coral.

From Morrison & Carr, New York.

Eight specimens illustrating the Manufacture of Iron Stone-China.

TO THE CHEMICAL AND NATURAL HISTORY SOCIETY OF THE LEHIGH UNIVERSITY.

For the purchase of the Werner Collection of Birds.

Messrs. E. P. Wilbur, H. E. Packer, G. B. Linderman, R. H. Sayre, R. A. Packer, C. O. Skeer and Robert Lockhart, each $200; W. L. Conyngham, $50; George W. Childs, $100.

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